

<b>4 CRUDE MAJOR EWO NO. :                      BE130-E1</b>		<b>REV: 1</b>
<b>PLANT:</b> 4 CRUDE	<b>SAP COST CENTER:</b> DD189-600	
<b>W/O # 320814-001</b>	<b>PROJECT / OUTAGE #:</b> SDD108A	
<b>3 SIDE CUT DEBOTTLENECK PROJECT</b>		
<b>MOC #:</b>		
<p style="text-align: center;"><b>Level 1 - Management of Change Review</b></p> <p><b>Will This Change:</b></p> <p><input type="checkbox"/> Cause the use of different feeds, chemicals, or catalysts?</p> <p><input type="checkbox"/> Cause the use of different process conditions, instrumentation, process control, or affect upstream/downstream plants?</p> <p><input type="checkbox"/> Cause the use of new or modified equipment (which is other than in-kind)?</p> <p><input type="checkbox"/> Alter equipment siting, building, trailer locations, roads, or fire protection?</p> <p><input type="checkbox"/> Require modifying existing and/or developing new procedures?</p> <p><input type="checkbox"/> Affect employee emergency response due to an organizational change?</p> <p><input type="checkbox"/> Transfer the responsibility for any environmental, health, or safety-related task?</p> <p><input type="checkbox"/> Alter the permanent staffing level or organization of any safety-sensitive job?</p>		
<b>SAFETY OPERATOR</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<b>IN VOC SERVICE?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No	<b>IN PLANT WELDING?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>APPROVALS</b>		
<b>OPERATIONS :</b> K. Sohnrey <i>[Signature]</i>	<b>DATE:</b> 6/14/11	<b>PHONE:</b> 2-2042
<b>ENGINEERING :</b> P. Murphy <i>[Signature]</i>	<b>DATE:</b> 6/14/11	<b>PHONE:</b> 2-1864
<b>IMPACT. T.L. :</b> M. Greenfield <i>[Signature]</i>	<b>DATE:</b> 6/15/11	<b>PHONE:</b> 2-1179
<b>MAINTENANCE:</b> V. Massaro <i>[Signature]</i>	<b>DATE:</b> 6/15/11	<b>PHONE:</b> 2-5995
<b>R. RAMIREZ</b> <b>JUN 15 2011</b>		

# Engineering Work Order - EWO

6/14/2011 1:01:32 PM

EWO #	5933	Revision:	1	Created On:	
Originator:	Black, Timothy S	ABU:	D&R	Plant:	4 Crude
MOC #:	23106	Section Two Reviewer:	Preciado, Silvano E.	Equipment#:	C-1130
Passport W/O:	320814	Project Number:		EWO Type:	Shutdown
Item:		SAP Cost Center:	DWRRI-DD189	Status:	Active
S/D EWO #:	BE130-E1				

Title: 3 S/C Debottleneck Project EWO

Scope: REV 1: THIS REVISION ADDS A "DETAIL 3" AND REVISES "SECTION A-A" ON DRAWING D-371842 PER COMMENTS BY THE CITY OF RICHMOND PLAN CHECK ENGINEER. AN ADDITIONAL NOTE ON THE CONTRACTOR WELD PROCEDURE ALSO REFLECTS THESE CHANGES TO THE WELD DETAILS.

The flow of 3 S/C out of C-1100 to C-1130 is currently bottlenecked (hydraulically limited) at 29 MBD. Because of this, the system is unable to recover all of the distillate available in the crude. Debottlenecking the system to allow 32.5 MBD of 3S/C in max distillate mode will enable the refinery to realize a financial benefit of approximately \$2.235MM/yr. This should be attainable by installing a higher C.V. control valve. In the unlikely but feasible event that this change is insufficient to adequately debottleneck the system, new tie-in points will also need to be installed, so that a piping spool can be installed on-the-run (OTR) to route the process from its current C-1130 inlet to a lower inlet that will provide additional head, if necessary.

The EWO outlines instructions to install a new, higher-C.V. model control valve, install two new tie-in points for a potential OTR piping spool addition, and to remove a reboiler from the column that will allow for the new piping tie-in. Additionally, the hole in the walkway platform left after the reboiler removal will also be patched and reinforced for structural integrity.

Safety Operator Required? ☐ Yes ☐ No In VOC Service? ☐ Yes ☐ No In Plant Welding? ☐ Yes ☐ No

	Person Responsible	Notified On	Completed By	Completed On
Design Review	Black, Timothy S.			
Process Engineering Review				
Instrumentation Review				
Control System Review				
Utilities Review				
Environmental/Regulatory Review	Elliott, Brad B.			
Land Usage Review				
VOC Review				
Safety/Regulatory Review				
Building Permits Review	Linares, Elena E.			
Mechanical Review				
Inspection Review				
Metallurgy Review				
Contruction Review				
Relief System Review				
Infrastructure Review				
aTrac Review				
Fire Proection Review	Bosworth, Gregory A.			
PHA/HSE Review				

# Engineering Work Order - EWO

6/14/2011 1:01:33 PM

<b>EWO #</b>	5933	<b>Revision:</b>	1	<b>Created On:</b>	
<b>Originator:</b>	Black, Timothy S	<b>ABU:</b>	D&R	<b>Plant:</b>	4 Crude
<b>MOC #:</b>	23106	<b>Section Two Reviewer:</b>	Preciado, Silvano E.	<b>Equipmen#:</b>	C-1130
<b>Passport W/O:</b>	320814	<b>Project Number:</b>		<b>EWO Type:</b>	Shutdown
<b>Item:</b>		<b>SAP Cost Center:</b>	DWRRI-DD189	<b>Status:</b>	Active
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## Approvers Section

<b>Lead Engineer:</b>	Gish, Kurt E.	6/1/2011	Gish, Kurt E.	6/9/2011
<b>Maintenance:</b>	Massaro, Vincent R.	6/9/2011	Massaro, Vincent R.	6/9/2011
<b>Building Permit:</b>	Linares, Elena E.	6/9/2011		
<b>Inspection:</b>				
<b>Operations:</b>	Sohnrey, Kenneth C.	6/9/2011	Sohnrey, Kenneth C.	6/14/2011

## 1.0 SCOPE

The flow of 3 S/C out of C-1100 to C-1130 is currently bottlenecked (hydraulically limited) at 29 MBD. Because of this, the system is unable to recover all of the distillate available in the crude. Debottlenecking the system to allow 32.5 MBD of 3S/C in max distillate mode will enable the refinery to realize a financial benefit of approximately \$2.235MM/yr. This should be attainable by installing a higher C.V. control valve. In the unlikely but feasible event that this change is insufficient to adequately debottleneck the system, new tie-in points will also need to be installed, so that a piping spool can be installed on-the-run (OTR) to route the process from its current C-1130 inlet to a lower inlet that will provide additional head, if necessary.

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**REV 1:** THIS REVISION ADDS A "DETAIL 3" AND REVISES "SECTION A-A" ON DRAWING D-371842 PER COMMENTS BY THE CITY OF RICHMOND PLAN CHECK ENGINEER. AN ADDITIONAL NOTE ON THE CONTRACTOR WELD PROCEDURE ALSO REFLECTS THESE CHANGES TO THE WELD DETAILS.

## 2.0 MATERIALS

- 2.1 New 20" XS x 8" Std. Wt. reducer ordered under **MR # 177906**.
- 2.2 New Control Valve 11LV030 purchased under **MR # 176102**.
- 2.3 New ¼" CS plate (ASTM A36 or A516 Gr. 70) and new C4x5.4 (ASTM A36) channel sections, for platform structural repairs, **to be provided by Maintenance**. Additional detail can be found on Drawings D-371841-0 and D-371842-2, attached.
- 2.4 Maintenance is to provide all remaining bulk and consumable materials including welding rods.

## 3.0 GENERAL INSTRUCTIONS

- 3.1 Piping work shall be in accordance with the "Richmond Refinery Metals Craft Quality Assurance Procedures".
- 3.2 Pipe class for this EWO is 3CS24.
- 3.3 Field verify all dimensions prior to fabrication.
- 3.4 Work shall be performed according to the following (hard copies available upon request):
  - 3.4.1 Refinery Instructions -9900 – "Release of Operating Equipment for Mechanical Work".
  - 3.4.2 All piping fabrication shall conform to ASME B31.3
  - 3.4.3 All bolting shall be per drawings and Chevron standard Flange Gasket and Bolting, GR-800, Chart per Gen-SC-5209.

3.4.4 All line cutting to be performed per "Line Cutting Approval Procedure", RI-341, Sect 16.

3.5 Chevron Inspections to witness and accept all hydro tests.

#### 4.0 WORK DESCRIPTION

##### 4.1 General Work Requirements / Instructions

- 4.1.1 **HOLD POINT:** ALL PLATFORM STRUCTURAL WORK OUTLINED IN THIS EWO SHALL COMPLY WITH GUIDELINES CALLED OUT IN CITY OF RICHMOND BUILDING PERMIT **#11-01834.**
- 4.1.2 Demo existing section of piping and old control valve as shown on Demo P&ID D-308311 and Demo Isometric #1 (0955-006-001), attached.
- 4.1.3 Demo and remove abandoned reboiler E-1137B in accordance with Demo P&ID D-308311 and Demo Isometric #2 (0955-006-003), attached. **After reboiler is removed, take necessary precautions to ensure hole in platform is covered/blocked such that the potential for falls is reasonably eliminated.**
- 4.1.4 **HOLD POINT:** PRIOR TO BEGINNING FABRICATION OF NEW PLATFORM SECTIONS FOLLOWING REMOVAL OF REBOILER, **CONTRACTOR SHALL** CONTACT ENGINEER OF RECORD (EOR) AL GREENE ([AGFO@CHEVRON.COM](mailto:AGFO@CHEVRON.COM)) AT (510) 242-9010. **EOR MUST** OBSERVE THE EXISTING FRAMING AFTER PROCESS VESSEL IS REMOVED AND BEFORE ANY EXISTING FLOOR PLATE IS CUT. **EOR MUST** ALSO VERIFY NEW FRAMING C4 MEMBERS IN PLACE BEFORE PLACEMENT OF NEW FLOOR PLATE. **EOR MUST** ALSO REVIEW AND APPROVE ANY STRUCTURAL WELD PROCEDURE PRIOR TO FABRICATION AS WELL.
- 4.1.5 Pending EOR approval of items called out in General Notes 12-14 of Drawing D-371841-0, patch hole in platform at old reboiler location per Drawings # D-371841-0 and D-371842-2.
- 4.1.6 Install new control valve 11LV030 at old control valve location per Construction P&ID D-308311 and Construction Isometric #1 (0955-006-001). New control valve instrumentation to be installed in accordance with Shutdown EWO #BE608-E1.
- 4.1.7 Install new piping and tie-points at location adjacent to control valve per Construction P&ID D-308311 and Construction Isometric #1 (0955-006-001), and at location of old reboiler outlet per Construction P&ID D-308311, Construction Isometric #2 (0955-006-003), and Construction Isometric #3 (0955-019-021).
- 4.1.8 Ensure all other piping connections to old reboiler are isolated with blind flanges as applicable.
- 4.1.9 Hydrotest new piping per Section 4.5.
- 4.1.10 Coat structural steel platform per Section 4.6.

4.2 Welding Requirements

4.2.1 Piping Welds

4.2.1.1 Use either of the following weld procedures:

- 4.2.1.1.1 CVX-106 (GTAW Root: ER70S-2 or ER70S-3, GTAW fill: ER70S-2 or ER70S-3)
- 4.2.1.1.2 CVX-109 (GTAW Root (and optional 2<sup>nd</sup> pass): ER70S-2 or ER70S-3, SWAW fill: E7018)
- 4.2.1.1.3 Chevron approved contractor equivalent to the preceding procedures. These alternatives shall be approved by Chevron weld inspector.

4.2.2 Structural Welds on Platform (per Drawings D-371841-0 and D-371842-2)

- 4.2.2.1 Use TIMEC/WorldWide welding procedure WPS D1.1-SG-01A02 (SMAW Root: E7018, SMAW Fill E7018). **NOTE:** Use EOR approved/signed version that is included in this EWO package only.

4.3 Stress-Relieving Requirements

N/A

4.4 NDE Requirements

- 4.4.1 RT 5% of random butt welds.
- 4.4.2 PT weld prep, first pass, and final pass on all new to old welds.
- 4.4.3 PT final pass of all new to new welds.
- 4.4.4 Visual test required for all welds.
- 4.4.5 Any additional NDE as specified by Company Weld Inspector.

4.5 Hydrotest Requirements

- 4.5.1 Hydrotest all welds at 1125 psig, 10 minutes minimum, using fresh water.

4.6 Coating Requirements

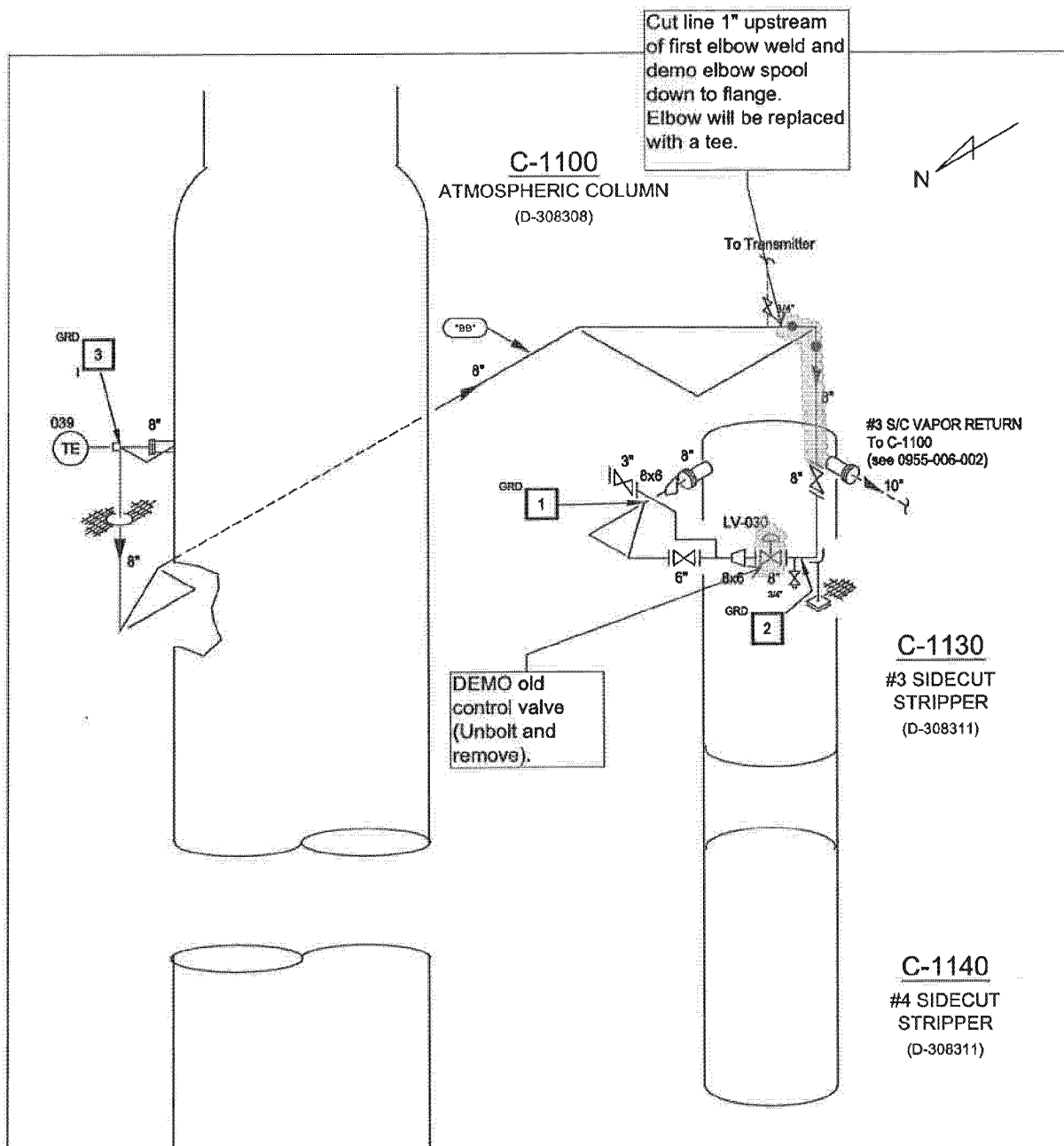
- 4.6.1 Coat top surface of new platform materials per Chevron Coating System 4.5, Color: Black.
- 4.6.2 Coat bottom surface of platform plate material and all new channel iron sections per Chevron Coating System 2.15.1 or 3.1. Color to match existing.

5.0 ATTACHMENTS

Weld Procedure(s)	CVX-106 CVX-109 TIMEC WPS D1.1-SG-01A02
Platform Repair Civil Drawings	D-371841-0 D-371842-2
DEMO P&ID	D-308311
DEMO Isometrics	Demo Isometric #1 (0955-006-001) Demo Isometric #2 (0955-006-003)
Construction P&ID	D-308311
Construction Isometric	Construction Isometric #1 (0955-006-001) Construction Isometric #2 (0955-006-003) Construction Isometric #3 (0955-019-021)
Pipe Class Sheet	3CS24
Coating Systems	2.15.1 3.1 4.5
City of Richmond Building Permit	Permit # 11-01834







**THIS IS A HOT CIRCUIT.  
ALL TML's TO BE RT'd**

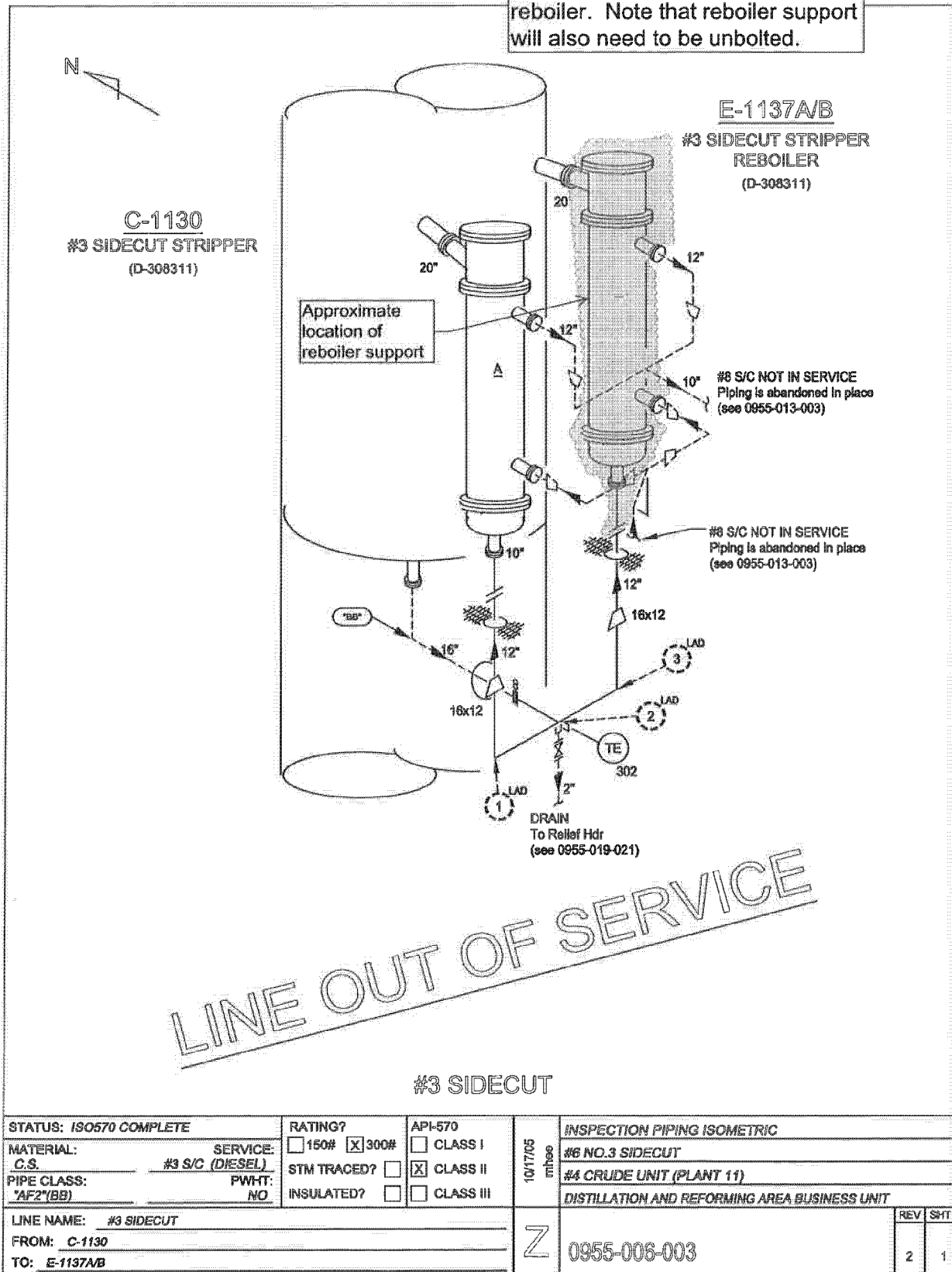
**C-1100 #3 SIDECUT OUTLET**

REVISION		
1	D&R 4Q2000 shutdown "As Built"	VMAP
	MOC# 4CU-281-00-050	POST
	08/02/01	TPVA

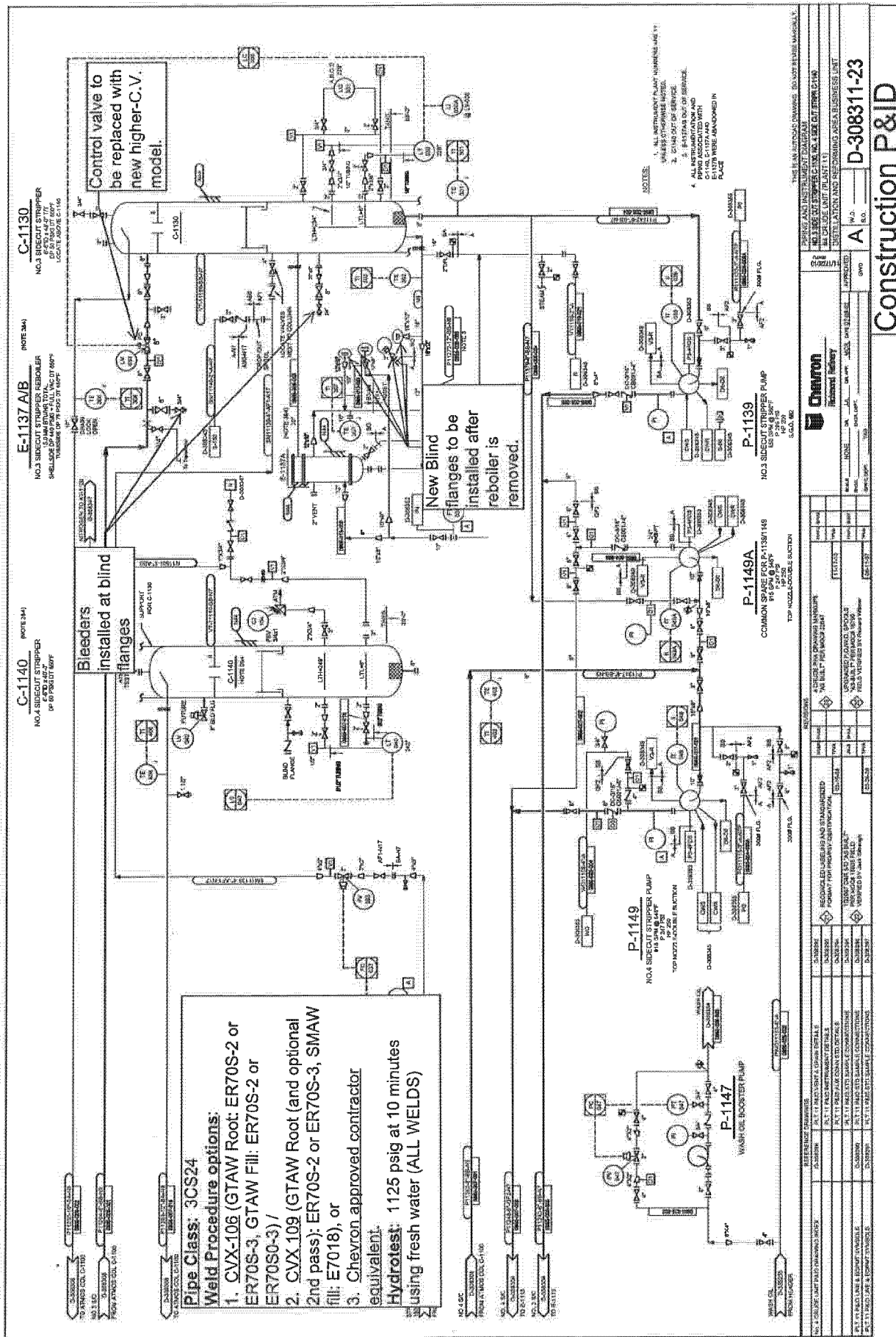
STATUS: ISO570 COMPLETE		RATING?	API-570	INSPECTION PIPING ISOMETRIC		
MATERIAL:	SERVICE:	<input type="checkbox"/> 150# <input checked="" type="checkbox"/> 300#	<input type="checkbox"/> CLASS I	WM-HU  <b>Z</b>	#6 NO.3 SIDECUT	
C.S.	#3 S/C (DIESEL)	STM TRACED? <input type="checkbox"/>	<input checked="" type="checkbox"/> CLASS II		#4 CRUDE UNIT (PLANT 11)	
PIPE CLASS:	PWHT:	INSULATED? <input checked="" type="checkbox"/>	<input type="checkbox"/> CLASS III		DISTILLATION AND REFORMING AREA BUSINESS UNIT	
AF2(BB)		NO				
LINE NAME: C-1100 #3 SIDECUT OUTLET				0955-006-001	REV	SHT
FROM: C-1100					5	1
TO: C-1130						

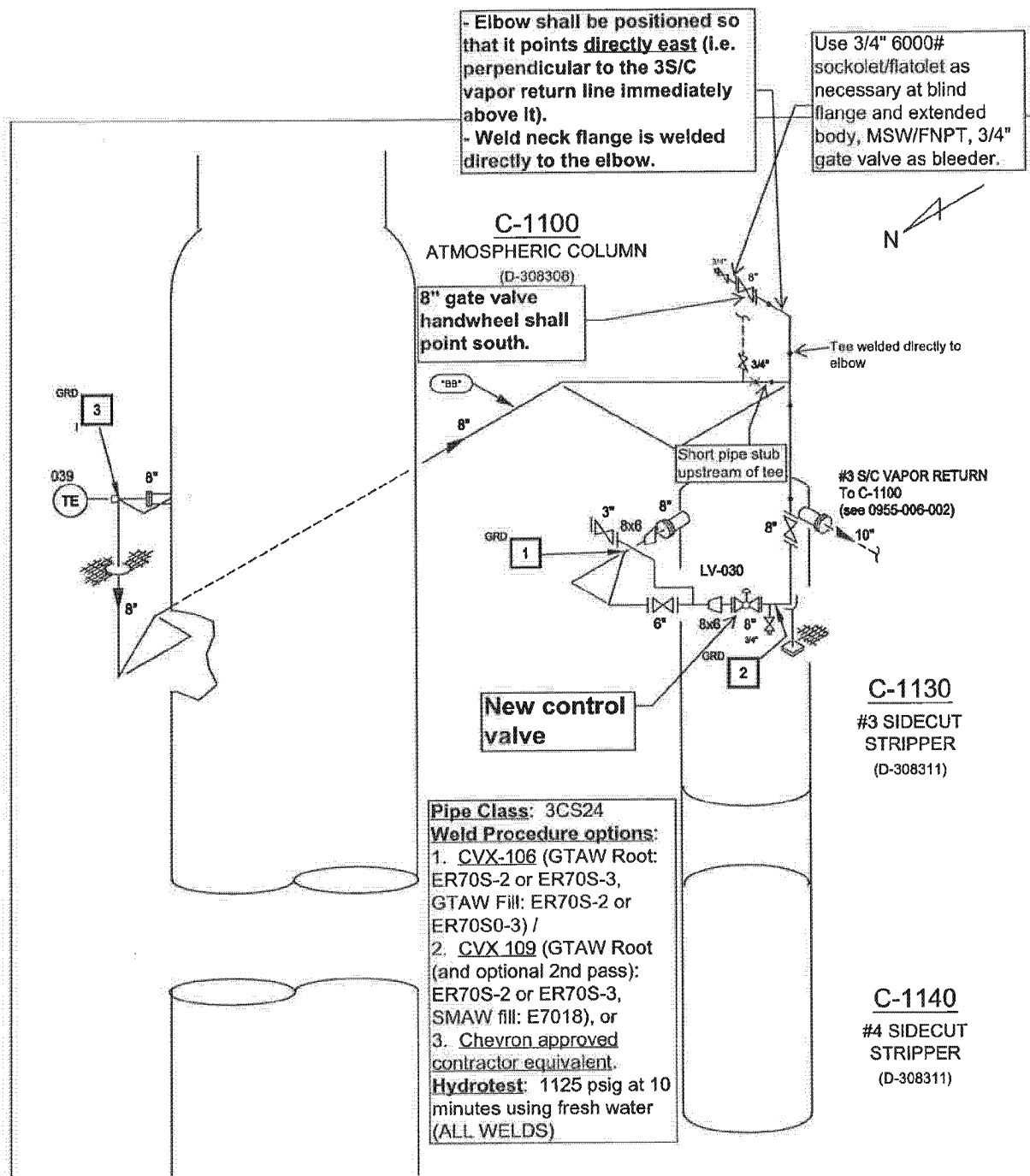
## Demolition Isometric #1

Unbolt at all flange locations indicated and remove entire reboiler. Note that reboiler support will also need to be unbolted.



## Demolition Isometric #2





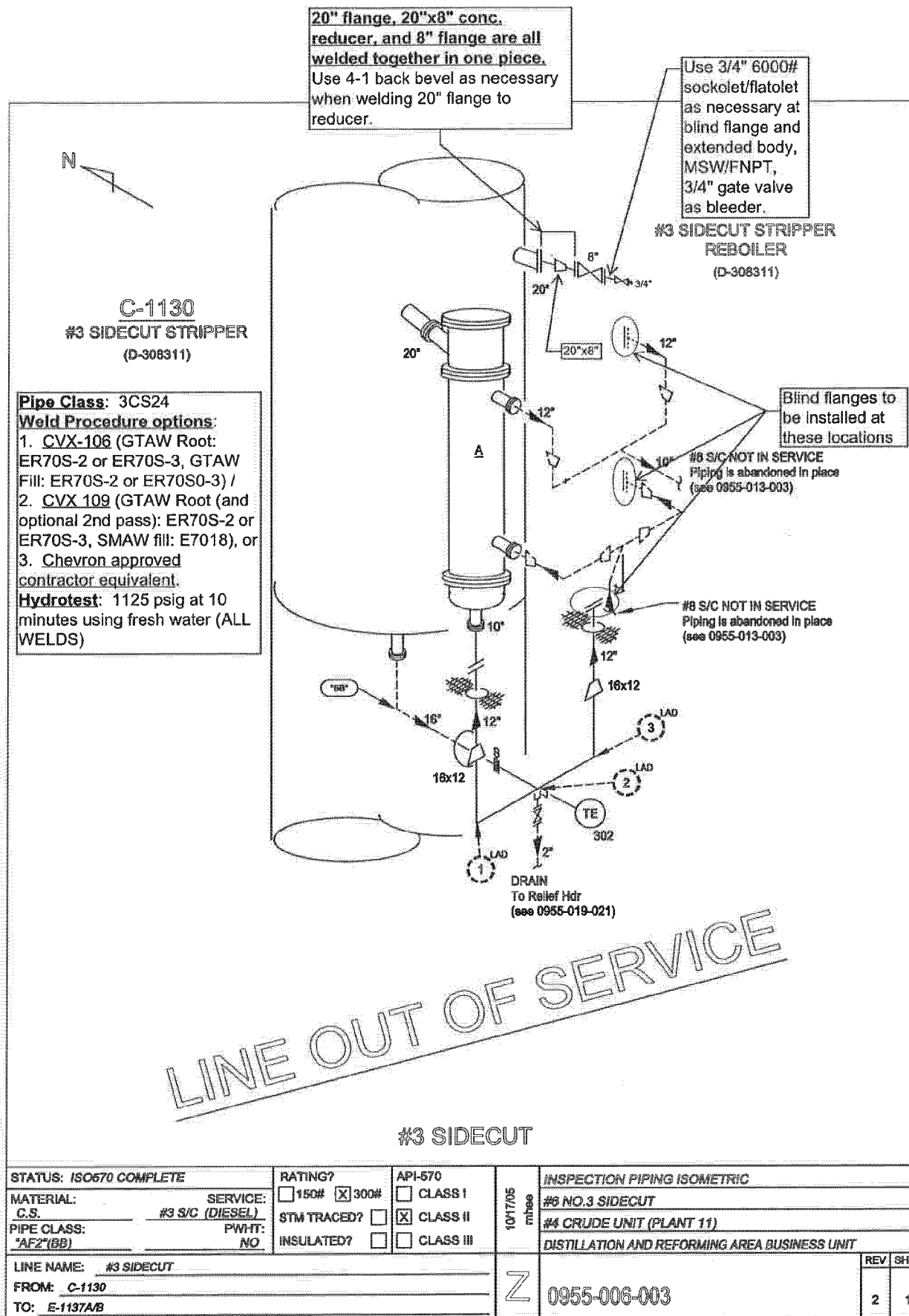
**THIS IS A HOT CIRCUIT.  
 ALL TML's TO BE RT'd**

### C-1100 #3 SIDECUT OUTLET

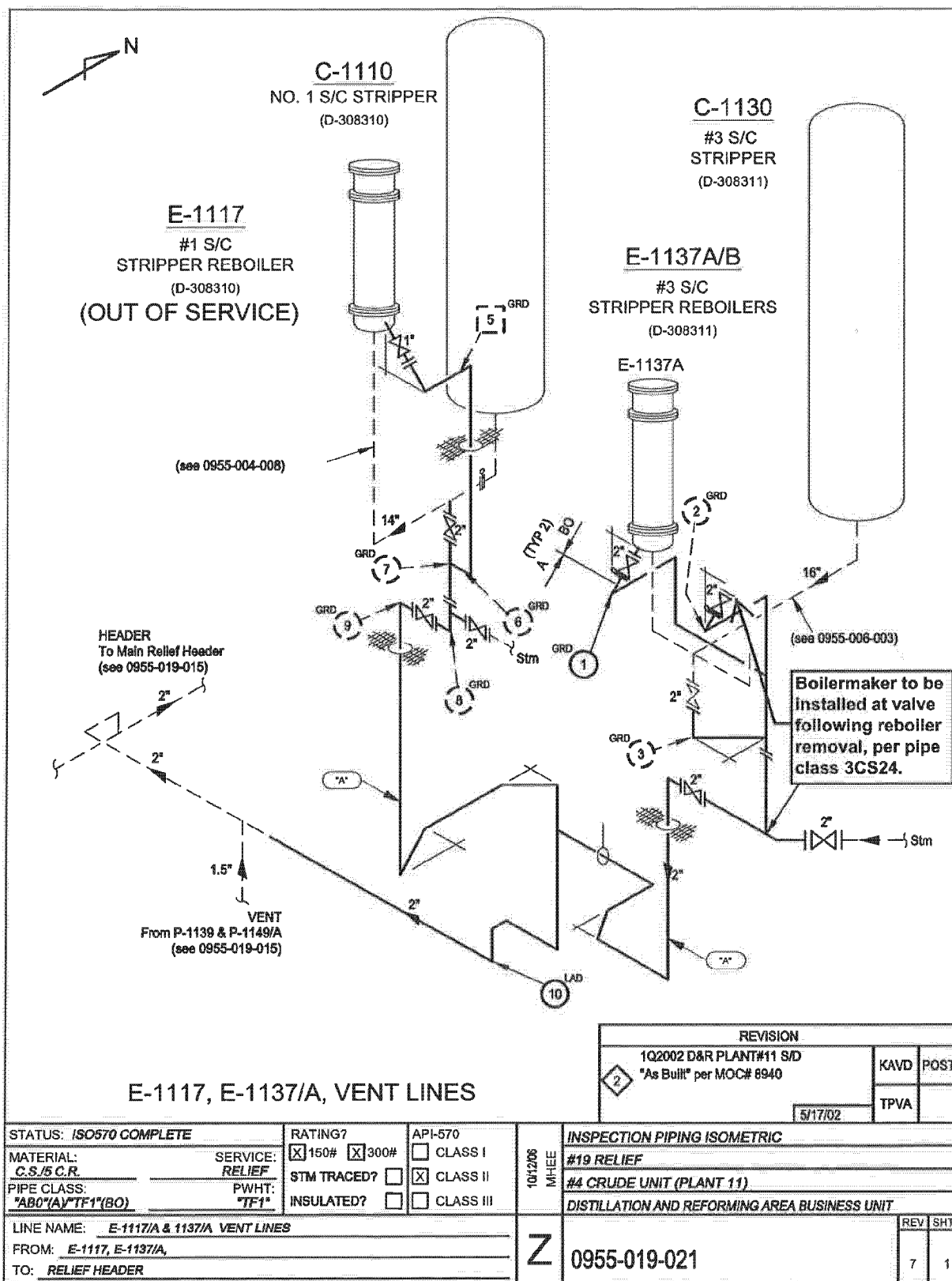
REVISION		
1	D&R 4Q2000 shutdown "As Built"	VMAP POST
	MOC# 4CU-281-00-050	
	08/02/01	TPVA

STATUS: ISO570 COMPLETE		RATING?		API-570		INSPECTION PIPING ISOMETRIC	
MATERIAL:		SERVICE:		<input type="checkbox"/> 150# <input checked="" type="checkbox"/> 300#		<input type="checkbox"/> CLASS I	
C.S.		#3 S/C (DIESEL)		STM TRACED? <input type="checkbox"/>		<input checked="" type="checkbox"/> CLASS II	
PIPE CLASS:		PWHT:		INSULATED? <input checked="" type="checkbox"/>		<input type="checkbox"/> CLASS III	
"AF2"(BB)		NO					
LINE NAME: C-1100 #3 SIDECUT OUTLET						Z	
FROM: C-1100							
TO: C-1130							
						0955-006-001	REV SH
							5

## Construction Isometric #1



## Construction Isometric #2



## Construction Isometric #3

# GENERAL NOTES

- Design is per CBC 2010.
- Steel channel shapes shall conform to ASTM A36. Plate shall conform to ASTM A36 or A516 Gr. 70.
- Fabricate and erect structural and miscellaneous steel per AISC 360-05, Specification for Structural Steel Buildings, AISC 303-10, Code of Standard Practice for Steel Buildings & Bridges.
- Welding workmanship, materials and inspection shall conform to AWS D1.1. All welds are subject to visual inspection. Weld filler material shall have a minimum tensile strength of 70,000 psi. Any SMAW welding shall be performed with low hydrogen electrodes. Welding shall be performed in accordance with a Welding Procedure Specification (WPS) subject to EOR approval.
- Special inspection per CBC 2010 for this minor work is waived subject to the approval of the Building Official.
- All workmanship and materials shall be subject to the Owner's inspection for conformance to the plans and specifications.
- The Contractor shall arrange for timely on/off-site inspections. Work installed without inspection is subject to replacement at Contractor's expense.
- The Engineer of Record (EOR) is Al Greene, [ag@chevron.com](mailto:ag@chevron.com), 510-242-9010.
- In the event of conflicting wording between the specifications and drawings, contact the Engineer of Record for clarifications.
- Contractor to field verify dimensions and elevations prior to excavation and fabrication.
- Deviations from what is either drawn or specified herein are subject to prior written approval. Requests for changes or deviations shall be documented and submitted in a timely manner to the EOR.

## SPECIAL JOB CONDITIONS

See Engineering Work Order (EWO).

### 12. DOCUMENTATION HOLD POINTS:

Submit the following documents to the EOR for review and approval before fabrication or construction in a timely manner: (a) weld procedure specification (WPS).

### 13. STRUCTURAL OBSERVATION HOLD POINT

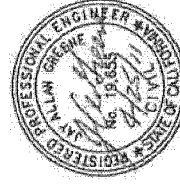
EOR (or his designee) observation of: (a) Existing framing and plate after process vessel is removed and before any existing floor plate is cut. (b) New framing C4 members in place and before placement of floor plate.

### 14. CONSTRUCTION HOLD POINT

(a) Items 13 (a) and 13 (b).

### SEISMIC AND WIND DESIGN DATA

Not applicable.



THIS IS AN AUTOMATIC DRAWING. DO NOT REUSE MANUALLY.				GENERAL NOTES C-1130 PLATFORM REPAIR 24 DRIVE PLANT 11 DISTILLER & REFORMING AREA BUSINESS UNIT	
DATE	10/27/10	BY	AL GREENE	DATE	10/27/10
SCALE	AS SHOWN	SCALE	AS SHOWN	SCALE	AS SHOWN
REVISIONS		REVISIONS		REVISIONS	
NO.	1	DESCRIPTION	REVISION FOR CORRECTION	NO.	1
DATE	10/27/10	DATE	10/27/10	DATE	10/27/10
BY	AL GREENE	BY	AL GREENE	BY	AL GREENE
CHECKED		CHECKED		CHECKED	
DATE		DATE		DATE	
BY		BY		BY	
APPROVED AL GREENE PROFESSIONAL ENGINEER No. 19855 STATE OF CALIFORNIA			M.D. M D-371841-0		





SERVICE:	Process	LIMITED BY:	Flanges
RATING CLASS:	300 RF, ASME B16.5-2009	MATERIAL:	Carbon Steel
TEMPERATURE LIMIT:	Min. to 750F	DESIGN CODE:	ASME B31.3-2008
NOMINAL CORROSION ALLOWANCE:	0.125 in. (0.100 in. MIN)	STRESS RELIEF:	NONE
VALVE TRIM:	API Trim #8 (13CR & HF)	EXAMINATION:	5% RT, PT & HF

\*LIMITATIONS: Pressure limits for steels in hydrogen service. See Note 302.

PRESSURE - TEMPERATURE RATINGS			NOTE: HYDROTEST @ AMBIENT = 1125 psig					
TEMP F	Min. to 100	200	300	400	500	600	700	750
psig	740	675	655	635	600 (280)*	550 (65)*	535 (50)*	505 (50)*
TEMP C	Min. to 38	93	149	204	260	316	371	399
kPag	5100	4655	4515	4380	4135	3795	3690	3480

For NPS 3/4 through NPS 24 (Full flange ratings per ASME B16.5, Table 2-1.1.)

MINIMUM TEMPERATURE (see Note 300)				
SIZE:	3/4" - 16"	18"	20"	24"
°F:	-20	-7	-2	+9
°C:	-29	-21	-19	-12

ITEM	NOTES	NPS	SCH/RAT	ENDS	DESCRIPTION	ITEM CODE
PIPE	20					
		3/4 - 1-1/2	160	PE	CS, SMLS, ASTM A106-B	L11LA1B
		2 - 3	XS	BE	CS, SMLS, ASTM A106-B	L11NA2A
		4 - 10	STD WT	BE	CS, SMLS, ASTM A106-B	L11MA2A
		12 - 24	40	BE	CS, SMLS, ASTM A106-B	L11EA2A
NIPPLES	03, 20					
Branch		3/4 - 1-1/2	160	PE	CS, SMLS, ASTM A106-B	L34LAEJ
Branch		3/4 - 1-1/2	XXS	TOE-POE	CS, SMLS, ASTM A106-B	L34PAHJ
Swage (CONC)		3/4 - 1-1/2	160	BBE	CS, ASTM A234-WPB-S, MSS SP-95	L55LA1VA
Swage (CONC)		3/4 - 1-1/2	XXS	BLE-TSE	CS, ASTM A234-WPB-S, MSS SP-95	L35PBMQ
FITTINGS						
Sockolet		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, MSS SP-97	L36VBDT
Thredolet	03	3/4 - 1-1/2	Class 6000	THRD	CS, ASTM A105, MSS SP-97	L36VBAT
SW Elbolet		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105	L36VBDU
Latrolet	92	3/4 - 1-1/2	160	Weld	CS, ASTM A105	L56LA1K
Weldolet	05	3/4 - 1-1/2	160	Weld	CS, ASTM A105, MSS SP-97	L56LA1H
90 ELL		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, ASME B16.11	L30VBDB
45 ELL		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, ASME B16.11	L30VBDA
Tee		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, ASME B16.11	L31VBD
Tee	03	3/4 - 1-1/2	Class 6000	THRD	CS, ASTM A105, ASME B16.11	L31VBA
Tee (RED)		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, ASME B16.11	L31VBDD
Plug	03	3/4 - 1-1/2		THRD	CS, ASTM A105, round head, ASME B16.11	L370ABW
Plug		3/4 - 1-1/2		PE	CS, ASTM A105, round head, ASME B16.11	L370AEW
Coupling		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, ASME B16.11	L34VBDH
Cap		3/4 - 1-1/2	Class 6000	SW	CS, ASTM A105, ASME B16.11	L37VBDX
Reducer (CONC)		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L55NA1DA
Reducer (BCC)		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L55NA1DB
Weldolet	05	2 - 3	XS	Weld	CS, ASTM A105, MSS SP-97	L56NA1H
90 LR ELL		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L50NA1BC
45 LR ELL		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L50NA1AC
Tee		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L51NA1
Tee (RED)		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L51NA1D
Cap		2 - 3	XS	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L57NA1R
Reducer (CONC)		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L55MA1DA
Reducer (ECC)		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L55MA1DB
Weldolet	05	4 - 8	STD WT	Weld	CS, ASTM A105, MSS SP-97	L56MA1H
90 LR ELL		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L50MA1BC
45 LR ELL		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L50MA1AC
Tee		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L51MA1
Tee (RED)		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L51MA1D

ITEM	NOTES	NPS	SCH/RAT	ENDS	DESCRIPTION	ITEM CODE
Cap		4 - 10	STD WT	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L57MA1R
Reducer (CONC)		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L55EA1DA
Reducer (ECC)		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L55EA1DB
90 LR ELL		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L50EA1BC
45 LR ELL		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L50EA1AC
Tee		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L51EA1
Tee (RED)		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L51EA1D
Cap		12 - 24	40	Weld	CS, ASTM A234-WPB-S, ASME B16.9	L57EA1R
<b>VALVES</b>						
Gate	67	1/2 - 1/2	Class 800	MSW/FSW	CS body, API #8 trim, BB, RP, EXTD BDY	L20KAXHDM
Gate	15	3/4 - 1-1/2	Class 300	RF	CS body, API #8 trim, BB, RP	L20FA3DD
Gate	06	3/4 - 1-1/2	Class 800	T/SW	CS body, API #8 trim, BB, RP	L20KA7DD
Gate		3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BB, RP	L20KA1DD
Gate	325	3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BB, FP	L20KA1DD
Gate	161	3/4 - 1-1/2	Class 800	T/SW	CS body, API #8 trim, BELOW SEAL, BB, RP	L20KA7DDL
Gate	161	3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BELOW SEAL, BB, RP	L20KA1DDL
Gate	161,325	3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BELOW SEAL, BB, FP	L20KA1DDL
Gate	06	3/4 - 1-1/2	Class 800	MSW/FNPT	CS body, API #8 trim, BB, RP, EXTD BDY	L20KAYHDM
Gate		2 - 6	Class 300	RF	CS body, API #8 trim, BB, FP	L20FA3DD
Gate		8 - 24	Class 300	RF	CS body, API #8 trim, BB, FP, GO	L20FA3DDF
Globe	161, 307	3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BELOW SEAL, WB	L21KA1JEL
Globe	307	3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BB	L21KA1DE
Globe	307	2 - 2	Class 300	RF	CS body, API #8 trim, BB	L21FA3DE
Globe	307	3 - 8	Class 300	RF	CS body, API #8 trim, BB, GO	L21FA3DEB
Check	61,328	3/4 - 1-1/2	Class 800	SW	CS body, API #8 trim, BC, piston, HORIZ	L22KA1TEF
Check	62,328	2 - 24	Class 300	RF	CS body, API #8 trim, BC, Swing	L22FA3PE
Check	62,328	2 - 24	Class 300	RF	CS body, API #8 trim, Dual Plate	L22FA3LEH
Ball	26, 101, 164	2 - 12	Class 300	RF	CS, body T3 MOD, Orbit H8 seat	L25FB3FD
Ball	26, 63, 101	2 - 12	Class 300	RF	CS, body T3 MOD, Orbit H seat	L25FB3FF
Butterfly	101	2 - 24	Class 300	RF	CS body, 316 SS trim, Flg, Triple Offset GO	L26FA3TJM
<b>FLANGES</b>						
Socket Weld	02	3/4 - 1-1/2	Class 300	RF	CS, ASTM A105, ASME B16.5, 160 Bore	L40FA3BL
Blind		3/4 - 24	Class 300	RF	CS, ASTM A105, ASME B16.5	L43FA3
Blind Spectacle		3/4 - 14	Class 300	RF	CS, ASTM A516-70, ASME B16.48	L45FA3E
Spacer Ring		16 - 24	Class 300	RF	CS, ASTM A516-70, ASME B16.48	L45FA3FZ
Blind Plate		16 - 24	Class 300	RF	CS, ASTM A516-70, ASME B16.48	L45FA3GZ
Weld Neck		2 - 3	Class 300	RF	CS, ASTM A105, ASME B16.5, XS Bore	L40FA3DN
Weld Neck		4 - 10	Class 300	RF	CS, ASTM A105, ASME B16.5, STD WT Bore	L40FA3DM
Weld Neck		12 - 24	Class 300	RF	CS, ASTM A105, ASME B16.5, 40 Bore	L40FA3DE
Pair WN Orifice		2 - 3	Class 300	RF	CS, ASTM A105, ASME B16.36, 1/2 SW taps, XS Bore	L42FA3DNL
Pair WN Orifice		4 - 10	Class 300	RF	CS, ASTM A105, ASME B16.36, 1/2 SW taps, STD WT Bore	L42FA3DML
Pair WN Orifice	17	12 - 18	Class 300	RF	CS, ASTM A105, ASME B16.36, 1/2 SW taps, 40 Bore	L42FA3DEL
<b>GASKETS</b>						
		3/4 - 24	Class 300	RF	Spiral wound type 316L SS w/ flexible Inhibited Graphite filler, ASME B16.20, w/inner ring.	L61FF1CAC
	301	3/4 - 24	Class 300		KAM style, 316LSS w/APX-2 Graphite, EXH-SU-5151	L61FF1ZA
<b>BOLTING</b>						
Stud Bolts	310	3/4 - 24			ASTM A193, Gr B7 stud w/ 2 heavy hex nuts ASTM A194, Gr 2H	L620BM
Stud Bolts	311	3/4 - 24			ASTM A193, Gr B16 stud w/ 2 heavy hex nuts ASTM A194, Gr 7	L620CM

[illegible]

**NOTES:**

- SERVICE:**

- HC Liquid Gas & Vapor (Corrosive)
- HC Liquid Gas & Vapor (Corrosive) w/ Trace H2S
- LPG (Corrosive) & LPG w/ Trace H2S
- LPG w/HC Mixtures (Corrosive)
- LPG w/HC Mixtures (Corrosive) w/ Trace H2S
- H2 & H2/HC to 450F (232C)
- H2 & H2/HC w/ Trace H2S to 450F (232C)



**CHEVRON CORPORATION**  
**ASME - Welding Procedure Specification (WPS)**  
WeldOffice WPS

WPS record number	CVX-106	Revision 1	Qualified to	ASME Section IX, B31.1 and B31.3
Date	3/23/2005		Company name	CHEVRON CORPORATION
Supporting PQR(s)	PQR-90-1 - Rev 1, PQR-175			
Reference docs.				

Scope	Gas Tungsten Arc Welding of carbon steel butt welds > 2" NPS Groove, no PWHT (As-welded)
Joint	Joint details for this welding procedure specification in: JOINTS section of this WPS

**BASE METALS (QW-403)**

Type	Carbon steel (P1)	P-no. 1	Grp-no. Any
Welded to	Carbon steel (P1)	P-no. 1	Grp-no. Any
Backing:	None	P-no.	Grp-no. -
Retainers			
Notes			

**THICKNESS RANGE QUALIFIED** (in.)

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Complete pen.	0.063	0.75	-	-
Impact tested	-	-	-	-
Partial pen.	-	-	-	-
Fillet welds	-	-	-	-

**DIAMETER RANGE QUALIFIED** (in.)

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Nominal pipe size	>2" nps	no max.	-	-

**FILLER METALS (QW-404)****THICKNESS RANGE QUALIFIED** (in.)

	SFA	Classification	F-no.	A-no.	Chemical analysis or Trade name	As-welded		With PWHT	
						Min.	Max.	Min.	Max.
GTAW	5.18	ER70S-2 or ER70S-3	6	1		0.063	0.75	-	-
GTAW	5.18	ER70S-2 or ER70S-3	6	1		0.063	0.75	-	-
Cons. insert	-	-	-	-	-	- None -			
Flux	-	-	-	-	-	- None -			

**WELDING PROCEDURE**

Welding process		GTAW		GTAW	
Type		Manual GTAW Root Pass		Manual GTAW Fill	
Preheat temperature (°F)		50		50	
Maximum interpass temperature (°F)		500		500	
Tungsten size (in.)		3/32 or 1/8		3/32 or 1/8	
Tungsten type		SFA 5.12 EWTh-2		SFA 5.12 EWTh-2	
Filler metal size (in.)		3/32 or 1/8		3/32 or 1/8	
Layer number		First layer only		2 and above	
Position of groove		All		All	
Weld progression		Uphill		Uphill	
Current/polarity		DCEN (straight polarity)		DCEN (straight polarity)	
Amperes		55 - 90 70 - 125		55 - 100 70 - 160	
Volts		8 - 13 8 - 13		8 - 13 8 - 13	
Travel speed (in./min)		1 - 8 for all		1 - 8 for all	
Maximum heat input (Btu/in.)					
DC pulsing current		Not used		Not used	
Shielding: Gas type		Argon		Argon	
Flow rate (cfh)		15 - 40		15 - 40	
Trailing: Gas type		None		None	
Flow rate (cfh)					
Backing: Gas type		None		None	
Flow rate (cfh)					
String or weave		Stringer		Stringer or Weave	
Orifice/gas cup size		0.5-0.75" - gas lens optional		0.5-0.75" - gas lens optional	
Multi/Single pass per side		Single pass		Multiple passes	
Weld deposit chemistry					
Notes					

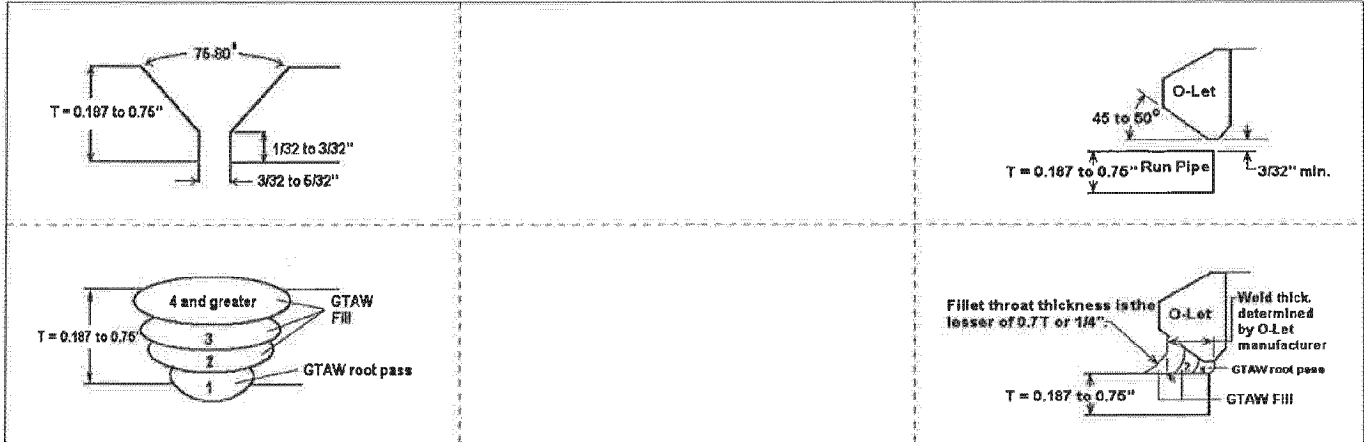


**CHEVRON CORPORATION**  
**ASME - Welding Procedure Specification (WPS)**

WeldOffice WPS

WPS record number	CVX-106	Revision	1	Qualified to	ASME Section IX, B31.1 and B31.3
Date	3/23/2005	Company name	CHEVRON CORPORATION		

JOINTS (QW-402) Typical joint(s). See actual production drawings and engineering specifications for details.



**PREHEAT TABLE**

Applicable standard	
ASME B31.1	175 (°F) for thickness over 1 (in.) and specified maximum carbon content over 0.30%. 50 (°F) for all other materials.
ASME B31.3	50 (°F) for thickness less than 1 (in.) and specified minimum tensile strength not over 71000 (psi). 175 (°F) for 1 (in.) and greater thickness, or if specified minimum tensile strength is over 71000 (psi).

**TECHNIQUE (QW-410)**

Peening	Not used
Surface preparation	Brushing and Grinding
Initial/interpass cleaning	Brushing, grinding, filing or rotary burring tools to remove all slag and surface oxide
Back gouging method	Not applicable

**NOTES**

1. This procedure is intended for routine shop and field welding of carbon steel butt welds and branches in larger diameters (> 2" NPS for the main line).
2. The welding technique is intended to employ GTAW for all layers to 1" maximum thickness.
3. The GTAW filler metal may be AWS/SFA 5.18 Classifications ER70S-2 or ER70S-3.
4. If the ambient temperature is less than 50 deg F, preheat the joint to "hand warm" for pipe thickness <1" thick. See Preheat Table for larger thickness.
5. Use stringer bead welding technique for the first pass; Use stringer or weave for the remaining passes.
6. This procedure is suitable for all positions, but all vertical welding shall be done uphill.
7. This procedure may be applied to all carbon steel butt welds where the main line is greater than 2" NPS.

**Signature 1**

Name	Signature
M. Fahrion	
Date	
3/23/2005	



**CHEVRON CORPORATION**  
**ASME - Welding Procedure Specification (WPS)**  
WeldOffice WPS

WPS record number	CVX-109	Revision 1	Qualified to	ASME Section IX, B31.1 and B31.3
Date	3/28/2005		Company name	CHEVRON CORPORATION
Supporting PQR(s)	PQR-90-1 - Rev 1, PQR-90-3 - Rev 1, GTAW-SMAW-PSP-3			
Reference docs.				

Scope	Gas Tungsten Arc and Shielded Metal Arc Welding of carbon steel butt welds > 2" NPS Grooves, no PWHT (As-welded)
Joint	Joint details for this welding procedure specification in: JOINTS section of this WPS

**BASE METALS (QW-403)**

Type	Carbon steel (P1)	P-no.	1	Grp-no.	Any
Welded to	Carbon steel (P1)	P-no.	1	Grp-no.	Any
Backing	None	P-no.		Grp-no.	-
Retainers					
Notes					

**THICKNESS RANGE QUALIFIED** (in.)

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Complete pen.	0.063	0.75	-	-
Impact tested	-	-	-	-
Partial pen.	-	-	-	-
Filet welds	-	-	-	-

**DIAMETER RANGE QUALIFIED** (in.)

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Nominal pipe size	>2" nps	no max	-	-

**FILLER METALS (QW-404)**

	SFA	Classification	F-no.	A-no.	Chemical analysis or Trade name	As-welded		With PWHT	
						Min.	Max.	Min.	Max.
GTAW	5.18	ER70S-2 or ER70S-3	6	1		0.063	0.75	-	-
GTAW	5.18	ER70S-2 or ER70S-3	6	1		0.063	0.75	-	-
SMAW	5.1	E7018	4	1		0.188	0.75	-	-
Cons. Insert	-	-	-	-	-	- None -			
Flux	-	-	-	-	-	- None -			

**WELDING PROCEDURE**

		GTAW	GTAW	SMAW
Welding process		Manual GTAW Root Pass	GTAW Optional 2nd Pass	Manual E7018 Fill
Type				
Preheat temperature	(°F)	50	50	50
Maximum interpass temperature	(°F)	500	500	500
Tungsten size	(in.)	3/32 or 1/8	3/32 or 1/8	-
Tungsten type		SFA 5.12 EWTh-2	SFA 5.12 EWTh-2	-
Filler metal size	(in.)	3/32 or 1/8	3/32 or 1/8	1/8 or 5/32 or 3/16
Layer number		First layer only	2nd layer if required	2 and above
Position of groove		All	All	All
Weld progression		Uphill	Uphill	Uphill
Current/polarity		DCEN (straight polarity)	DCEN (straight polarity)	DCEP (reverse polarity)
Amperes		55 - 90 70 - 125	55 - 90 70 - 125	110 - 150 135 - 190 200 - 280
Volts		8 - 13 8 - 13	8 - 13 8 - 13	20 - 28 20 - 28 20 - 28
Travel speed	(in./min)	1 - 8 for all	1 - 8 for all	2 - 5 for all
Maximum heat input	(kJ/in)			
DC pulsing current		Not used	Not used	-
Shielding:	Gas type	Argon	Argon	-
	Flow rate	15 - 40	15 - 40	-
Trailing:	Gas type	None	None	-
	Flow rate	-	-	-
Backing:	Gas type	None	None	-
	Flow rate	-	-	-
String or weave		Stringer	Stringer or Weave	Stringer or Weave
Orifice/gas cup size		0.5-0.75" - gas lens optional	0.5-0.75" - gas lens optional	-
Multi/Single pass per side		Single pass	Multiple passes	Multiple passes
Maximum pass thickness	(in.)	-	-	0.25
Weld deposit chemistry				
Notes				



**CHEVRON CORPORATION**  
**ASME - Welding Procedure Specification (WPS)**  
WeldOffice WPS

WPS record number	CVX-109	Revision 1	Qualified to	ASME Section IX, B31.1 and B31.3
Date	3/28/2005		Company name	CHEVRON CORPORATION

JOINTS (QW-402) Typical Joint(s). See actual production drawings and engineering specifications for details.


**PREHEAT TABLE**

Applicable standard	
ASME B31.1	175 (°F) for thickness over 1 (in.) and specified maximum carbon content over 0.30%. 50 (°F) for all other materials.
ASME B31.3	50 (°F) for thickness less than 1 (in.) and specified minimum tensile strength not over 71000 (psi). 175 (°F) for 1 (in.) and greater thickness, or if specified minimum tensile strength is over 71000 (psi).

**TECHNIQUE (QW-410)**

Peening	Not used
Surface preparation	Brushing and Grinding
Initial/interpass cleaning	Brushing, grinding, filing or rotary burring tools to remove all slag and surface oxide
Back gouging method	Not applicable

**NOTES**

1. This procedure is intended for routine shop and field welding of carbon steel butt welds and branches in larger diameters (> 2" NPS for the main line).
2. The welding technique is intended to employ GTAW for the first or first and second weld layers.
3. The GTAW filler metal may be AWS/SFA 5.18 Classifications ER70S-2 or ER70S-3.
4. E7018 welding electrodes will be used for all weld passes above the root pass or second pass.
5. If the ambient temperature is less than 50 deg F, preheat the joint to "hand warm" for pipe thickness <1" thick. See Preheat Table for larger thickness.
6. Use stringer bead welding technique for the first pass; Use stringer or weave for the remaining passes.
7. This procedure is suitable for all positions, but all vertical welding shall be done uphill.
8. This procedure may be applied to all carbon steel butt welds where the main line is greater than 2" NPS.

**Signature 1**

Name	Signature
M. Fahrion	
Date	
3/28/2005	



TIMEC Company, Inc.  
155 Corporate Place  
Vallejo, CA 94590

### AWS D1.1 Prequalified Welding Procedure Specification (WPS)

WPS No. **DI.1-SG-01A02**

Date **5/11/2011** Rev. No. **0**

Page 1 of 1

Reviewed By:

Rick Johnson

Date **5/11/2011** QC Manager (CWI)

Welding Process **SMAW**

Welding Method **Manual**

#### Joint Design Used

Weld Type **PJP Groove welds**

Joint Type **Butt joint**

Groove Type **Square groove**

Double Welded **No**

Backing **No** Material **N/A**

Root Opening **T1 / 2** Root Face **N/A**

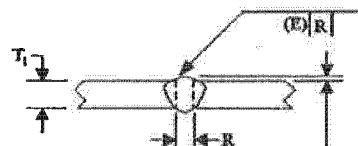
Groove Angle **N/A** Radius **N/A**

Back Gouging **No** Method **N/A**

Weld Size (E) = **T1 / 2**

Minimum PJP Weld Size (E) must meet requirements of Table 3.4

#### Joint Designation B-P1c



REINFORCEMENT 1/32 TO 1/16  
NO TOLERANCE

#### Base Metals

Base Metal **ASTM A 516, Grade 70**

Thickness: Groove **1/8 - 0.25 in.**

Thickness: Fillet **N/A**

Pipe Diameter **3/8 in. min.**

#### Filler Metals

AWS Specification **5.1**

AWS Classification **E7018**

Trade Name **Low H**

Weld Size **0.0625 in.**

#### Shielding

Gas **N/A**

Flow Rate **-**

Gas Cup Size **N/A**

Electrode-Flux (Class) **N/A**

Flux Trade Name **N/A**

#### Preheat

Preheat Temperature, Min. **32°F**

Interpass Temperature, Min. **32°F** Max. **550°F**

Minimum Preheat and Interpass Temperatures for given thickness:

1/8" thru 3/4" incl.: **32°F (70°F if less than 32°F)**

Over 3/4" thru 1-1/2" incl.: **50°F**

Over 1-1/2" thru 2-1/2" incl.: **150°F**

Over 2-1/2": **225°F**

#### Position

Weld Position: Groove **All Positions**

Weld Position: Fillet **N/A**

Vertical Progression **Vertical up**

#### Electrical Characteristics

Power Source

Current / Polarity **DCEP (reverse)**

Transfer Mode **N/A**

Tungsten Electrode: Type **N/A** Size **N/A**

#### Technique

Stringer or Weave Bead **Stringer or weave bead**

Multi-pass or Single Pass (per side) **Single or multipass**

Number of Electrodes **N/A**

Electrode Spacing: Longitudinal **N/A**

Laternal **N/A** Angle **N/A**

Contact Tube to Work Distance **N/A**

Peening **None**

Interpass Cleaning **Slag Hammer / Wire Brush**

#### Postweld Heat Treatment

Temperature **None**

Time (hr.) **None**

#### Welding Procedure

Pass or Weld Layer(s)	Process	Filler Metal		Current			Travel Speed (in/min)
		AWS Classification	Size (in.)	Type & Polarity	Amps	Volts	
Any	SMAW	E7018	3/32	DCEP (reverse)	70 - 100	18	5-7
Any	SMAW	E7018	1/8	DCEP (reverse)	90 - 150	19	5.5-7.5
Any	SMAW	E7018	5/32	DCEP (reverse)	130 - 210	21	5.5-7.5

#### Additional Notes

#### JOINT NOTES:

(b) Joint shall be welded from one side only. (c) SMAW detailed joints may be used for prequalified GMAW (except GMAW-S) and FCAW.

*Approved as noted,  
J.A. Greene (EOR)  
5/12/11*



## Two-Coating Systems

## Epoxy Mastic - Surface-Tolerant Primer - Aluminum Color Only | Aliphatic Polyurethane

2.15.1

**Surface Prep:** SSPC-SP7 (NACE No. 4) Brush-blast finish, preferred. SSPC-SP3 Power-brush finish, acceptable.

**Touch Up:** Use this system.

**Anchor Pattern:** 2.0 - 3.0 mils

**Total DFT:** 7.0 mils (min)

Coat, Generic Classification, DFT	Manufacturer	Product Designation	VOC (G/L)	By Max Svc Temp
<b>PRIMER</b>  <b>Epoxy Mastic - Surface Tolerant - Aluminum Filled</b>  <b>5.0 - 7.0 mils DFT</b>	Ameron	Amerlock 400 AL	120	
	Carboline	Carbomastic 15	88	
	Devoe	Devran 224 Aluminum	212	
	Hempel Coatings (USA), Inc.	Hempadur 45880-19870	215	
	International	Interseal 670 HS	240	
	Jotun Paints	Jotamastic 87 AL	110	
	PPG Industries	97-148	0	
	Sherwin Williams	Epoxy Mastic Aluminum II B62S100/BV100	171	
	Sigma Coatings	TCP Aluminum 7477	240	
	<i>System 2.15 is available in colors.</i>			
<b>TOPCOAT</b>  <b>Polyurethane - Aliphatic</b>  <b>2.0 - 3.0 mils DFT</b>	Ameron	Amercoat 450 Series	335	
	Carboline	Carbothane 134 HG	288	
	Devoe	Devthane 379	311	
	Hempel Coatings (USA), Inc.	5595U	312	
	Hempel Coatings (USA), Inc.	Hempathane 5595	332	
	International	Interthane 990	395	
	International	Interthane 990HS	332	
	Jotun Paints	Hardtop HB	256	
	PPG Industries	95-8512	0	
	Sherwin Williams	Hi-Solids Polyurethane B65-300 SeriesB65/	289	
	Sigma Coatings	Sigmadur 500 US	320	
<i>Respirators are strongly recommended when applying polyurethane.</i>				

Volatile Organic Compound (VOC) limit may vary by location. Check local standards for current VOC limits.  
Consult manufacturer's product data sheets for specific details about applying any coating.

Last Update: 5/31/2006

QRG - 29

September 2006

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### Coatings

Surface Prep:				
<b>Self-Cured Inorganic Zinc   Polyamide Epoxy (High Build)   Aliphatic Polyurethane</b>				
<b>3.1</b>				
SSPC-SP6 (NACE No. 3) Commercial blast finish.		Touch-up: Coating System (CS) 3.5. After applying the tie-coat: (Repair any damage exposing bare metal with CS 3.5. Repair any damage to the inorganic zinc primer, as necessary, with CS 3.5 to maintain specified film thickness.).		
Anchor Pattern:	1.5 - 2.5 mils			
Total DFT:	9.0 mils (min)			
Coat, Generic Classification, DFT	Manufacturer	Product	VOC	Temp Limit
<b>PRIMER</b> Self-Cured Inorganic Zinc - Solvent Reducible  <b>2.0 - 3.0 mils DFT</b>	Ameron	Dimetcote 9	491	
	Ameron	Dimetcote 9HS	\$323	
	Carboline	Carbozinc 11	515	
	Carboline	Carbozinc 11 HS	\$264	
	Devco	Catha-Coat 304V	\$336	
	Hempel Coatings (USA), Inc.	Galvosil 1568	\$320	
	Hempel Coatings (USA), Inc.	Galvosil 1578	520	
	International	Interzinc 22	490	
	International	Interzinc 22HS	\$340	
	Jotun Paints	Resist 78	465	
	PPG Industries	Metahide 1001 Primer 97-673/97-674	397	
	Sherwin Williams	Zinc Clad II B69V3/B69D11	462	
	Sherwin Williams	Zinc Clad II HS B69VZ1/B69VZ3/B69D11	\$312	
	Sigma Coatings	SigmaZinc 158	507	
	Keep inorganic zinc silicate mixed, using agitated pot while applying.			
<b>TIECOAT</b> Epoxy - Polyamide  <b>High Build</b>  <b>5.0 - 7.0 mils DFT</b>	Ameron	Amercoat 385	\$276	
	Carboline	Carboguard 893	\$195	
	Devco	Devran 224HS	\$212	
	Hempel Coatings (USA), Inc.	Hempadur 4520	400	
	Hempel Coatings (USA), Inc.	Hempadur 45880	\$215	
	International	Intergard 475 HS	\$175	
	Jotun Paints	Penguard Tiecoat 100	480	
	PPG Industries	97-148	\$0	
	Sherwin Williams	Macropoxy 646 B58-600 Series/B66V600	\$235	
	Sigma Coatings	SigmaCover 435	344	
<b>TOPCOAT</b> Polyurethane - Aliphatic  <b>2.0 - 3.0 mils DFT</b>	Ameron	Amercoat 450 Series	\$335	
	Carboline	Carbothane 134 HG	\$288	
	Devco	Devthane 379	\$311	
	Hempel Coatings (USA), Inc.	5595U	\$312	
	Hempel Coatings (USA), Inc.	Hempathane 5595	\$332	
	International	Interthane 990	395	
	International	Interthane 990HS	\$332	
	Jotun Paints	Hardtop HB	\$256	
	PPG Industries	95-8512	\$0	
	Sherwin Williams	HI-Solids Polyurethane B65-300 Series/B65/V30	\$289	
	Sigma Coatings	Sigmadur 500 US	\$320	
Respirators are strongly recommended when applying polyurethane.				
<b>Last Update:</b>		6/21/2006		

\$ VOC at or below 340 g/l is the anticipated regulatory limit. Check local standards for current VOC limits. Consult manufacturer's product data sheets for specific details about applying any coating.

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## Specialty Coating Systems

## Polyester Non-Skid | 20 - 30 Mesh Grit | Polyester Non-Skid

4.5

**Surface Prep:** SSPC-SP6 (NACE No. 3) Commercial blast finish; or SSPC-SP10 (NACE No. 2) Near-white finish (Depends on application.)

**Touch Up:** Use this system.

**Anchor Pattern:** 3.0 - 4.0 mils

**Total DFT:** 40.0 mils (min)

Coat, Generic Classification, DFT	Manufacturer	Product Designation	VOC (G/L)	By Max Svc Temp
<b>PRIMER</b>	Dudick	Protecto-Coat 500	250	
<b>Polyester Non-Skid</b>  <b>30.0 - 40.0 mils DFT</b>	Hempel Coatings (USA), Inc.	Polyester GF 35920	35	
	International	Interzone 2000	35	
	Jotun Paints	Baltoflake	75	
	PPG Industries	90000/90002	420	
	Sherwin Williams	Coroplate I 948-W-016/531-0-006	240	
	Must add sand.			

## TIECOAT

## 20 - 30 Mesh Grit

Apply grit to these coatings to provide a non-skid surface. Apply polyester first at 30 mils. Sprinkle Chevron-approved 20 - 30 mesh garnet, alumina, or other grit evenly over the coating at a rate of 15 - 18 lbs per 100 sq ft. Spray apply a final 10.0 mils of isopolyester over the grit while the first coat is still sticky.

<b>TOPCOAT</b>	Dudick	Protecto-Coat 500	250	
<b>Polyester Non-Skid</b>  <b>10.0 - 15.0 mils DFT</b>	Hempel Coatings (USA), Inc.	Polyester GF 35920	35	
	International	Interzone 2000	35	
	Jotun Paints	Baltoflake with Carborex 20	75	
	PPG Industries	94701, VOC	337	
	Sherwin Williams	Coroplate I 948-W-016/531-0-006	240	
	Must add sand.			

Volatile Organic Compound (VOC) limit may vary by location. Check local standards for current VOC limits. Consult manufacturer's product data sheets for specific details about applying any coating.

Last Update: 5/31/2006

QRG - 45

September 2006